# Evidence Search Service Results of your search request

## Prone Positioning for Covid-19 Patients Prior to Critical Care

**ID of request:** 22634  
**Date of request:** 7th April, 2020  
**Date of completion:** 15th April, 2020

If you would like to request any articles or any further help, please contact:  John Hudson at [John.hudson2@nhs.net](mailto:John.hudson2@nhs.net)

Please acknowledge this work in any resulting paper or presentation as: Evidence search: Prone Positioning for Covid-19 Patients Prior to Critical Care. John Hudson. (15th April, 2020). WOLVERHAMPTON, UK: The Royal Wolverhampton NHS Trust Library and Knowledge Service.

**Sources searched**  
EMBASE (5)  
NLM (3)

**Date range used** (5 years, 10 years): 2015-   
**Limits used** (gender, article/study type, etc.): English   
**Search terms and notes** (full search strategy for database searches below):

As mentioned under alternative terminology.

Retrospective paperwork.

For more information about the resources please go to: <https://base-library.nhs.uk/rwtlks/>.

## Summary of Results

Little information found relating to COVID-19, except for limited references about critical care context. Some earlier articles from an ARDS / SARS context, again relating mostly to critical care, was identied via a simple PubMed search.

The most interesting material was emailed to customer for digestion / follow-up.

Just days after this search was closed, the ICS released guidance (which was emailed to customer, as a search supplement):

Intensive Care Society (2020). Guidance for prone positioning of the conscious COVID-19 patient. April 13th 2020.

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### [B. Search History](#SearchHistory)

## A. Original Research

1. **Critical care response to a hospital outbreak of the 2019-nCoV infection in Shenzhen, China**  
   Liu Y. 2020;24(1):No page numbers.

1. **Guidance for prone positioning of the conscious COVID-19 patient.**  
   Anon. 2020;:No page numbers.

1. **Intubation and Ventilation amid the COVID-19 Outbreak: Wuhan's Experience**  
   Meng L. 2020;:No page numbers.

The COVID-19 outbreak has led to 80,409 diagnosed cases and 3,012 deaths in mainland China based on the data released on March 4, 2020. Approximately 3.2% of patients with COVID-19 required intubation and invasive ventilation at some point in the disease course. Providing best practices regarding intubation and ventilation for an overwhelming number of patients with COVID-19 amid an enhanced risk of cross-infection is a daunting undertaking. The authors presented the experience of caring for the critically ill patients with COVID-19 in Wuhan. It is extremely important to follow strict self-protection precautions. Timely, but not premature, intubation is crucial to counter a progressively enlarging oxygen debt despite high-flow oxygen therapy and bilevel positive airway pressure ventilation. Thorough preparation, satisfactory preoxygenation, modified rapid sequence induction, and rapid intubation using a video laryngoscope are widely used intubation strategies in Wuhan. Lung-protective ventilation, prone position ventilation, and adequate sedation and analgesia are essential components of ventilation management.

1. **Lower mortality of COVID-19 by early recognition and intervention: experience from Jiangsu Province**  
   Sun Q. 2020;10(1):No page numbers.

1. **Prone ventilation for novel coronavirus pneumonia: no time to delay**  
   Pan C. 2020;59:No page numbers.

1. **Gas Exchange in the Prone Posture**  
   Johnson N. J. 2017;62(8):1097-1110.

The prone posture is known to have numerous effects on gas exchange, both under normal conditions and in patients with ARDS. Clinical studies have consistently demonstrated improvements in oxygenation, and a multi-center randomized trial found that, when implemented within 48 h of moderate-to-severe ARDS, placing subjects in the prone posture decreased mortality. Improvements in gas exchange occur via several mechanisms: alterations in the distribution of alveolar ventilation, redistribution of blood flow, improved matching of local ventilation and perfusion, and reduction in regions of low ventilation/perfusion ratios. Ventilation heterogeneity is reduced in the prone posture due to more uniform alveolar size secondary to a more uniform vertical pleural pressure gradient. The prone posture results in more uniform pulmonary blood flow when compared with the supine posture, due to an anatomical bias for greater blood flow to dorsal lung regions. Because both ventilation and perfusion heterogeneity decrease in the prone posture, gas exchange improves. Other benefits include a more uniform distribution of alveolar stress, relief of left-lower-lobe lung compression by the heart, enhanced secretion clearance, and favorable right-ventricular and systemic hemodynamics.

1. **Treatment of ARDS With Prone Positioning**  
   Scholten E. L. 2017;151(1):215-224.

Prone positioning was first proposed in the 1970s as a method to improve gas exchange in ARDS. Subsequent observations of dramatic improvement in oxygenation with simple patient rotation motivated the next several decades of research. This work elucidated the physiological mechanisms underlying changes in gas exchange and respiratory mechanics with prone ventilation. However, translating physiological improvements into a clinical benefit has proved challenging; several contemporary trials showed no major clinical benefits with prone positioning. By optimizing patient selection and treatment protocols, the recent Proning Severe ARDS Patients (PROSEVA) trial demonstrated a significant mortality benefit with prone ventilation. This trial, and subsequent meta-analyses, support the role of prone positioning as an effective therapy to reduce mortality in severe ARDS, particularly when applied early with other lung-protective strategies. This review discusses the physiological principles, clinical evidence, and practical application of prone ventilation in ARDS.

1. **The critical care response to a hospital outbreak of Middle East respiratory syndrome coronavirus (MERS-CoV) infection: an observational study**  
   Al-Dorzi H. M. 2016;6(1):No page numbers.

Background: Middle East respiratory syndrome coronavirus (MERS-CoV) has caused several hospital outbreaks, including a major outbreak at King Abdulaziz Medical City, a 940-bed tertiary-care hospital in Riyadh, Saudi Arabia (August-September 2015). To learn from our experience, we described the critical care response to the outbreak. <br/>Method(s): This observational study was conducted at the Intensive Care Department which covered 5 ICUs with 60 single-bedded rooms. We described qualitatively and, as applicable, quantitatively the response of intensive care services to the outbreak. The clinical course and outcomes of healthcare workers (HCWs) who had MERS were noted. <br/>Result(s): Sixty-three MERS patients were admitted to 3 MERS-designated ICUs during the outbreak (peak census = 27 patients on August 25, 2015, and the last new case on September 13, 2015). Most patients had multiorgan failure. Eight HCWs had MERS requiring ICU admission (median stay = 28 days): Seven developed acute respiratory distress syndrome, four were treated with prone positioning, four needed continuous renal replacement therapy and one had extracorporeal membrane oxygenation. The hospital mortality of ICU MERS patients was 63.4 % (0 % for the HCWs). In response to the outbreak, the number of negative-pressure rooms was increased from 14 to 38 rooms in 3 MERS-designated ICUs. Patients were managed with a nurse-to-patient ratio of 1:0.8. Infection prevention practices were intensified. As a surrogate, surface disinfectant and hand hygiene gel consumption increased by ~30 % and 17 N95 masks were used per patient/day on average. Family visits were restricted to 2 h/day. Although most ICU staff expressed concerns about acquiring MERS, all reported to work normally. During the outbreak, 27.0 % of nurses and 18.4 % of physicians working in the MERS-designated ICUs reported upper respiratory symptoms, and were tested for MERS-CoV. Only 2/196 (1.0 %) ICU nurses and 1/80 (1.3 %) physician tested positive, had mild disease and recovered fully. The total sick leave duration was 138 days for nurses and 30 days for physicians. <br/>Conclusion(s): Our hospital outbreak of MERS resulted in 63 patients requiring organ support and prolonged ICU stay with a high mortality rate. The ICU response required careful facility and staff management and proper infection control and prevention practices.<br/>Copyright &#xa9; 2016, The Author(s).

1. **Prone position for acute respiratory failure in adults**  
   Bloomfield R. 2015;(11):Cd008095.

BACKGROUND: Acute hypoxaemia de novo or on a background of chronic hypoxaemia is a common reason for admission to intensive care and for provision of mechanical ventilation. Various refinements of mechanical ventilation or adjuncts are employed to improve patient outcomes. Mortality from acute respiratory distress syndrome, one of the main contributors to the need for mechanical ventilation for hypoxaemia, remains approximately 40%. Ventilation in the prone position may improve lung mechanics and gas exchange and could improve outcomes. OBJECTIVES: The objectives of this review are (1) to ascertain whether prone ventilation offers a mortality advantage when compared with traditional supine or semi recumbent ventilation in patients with severe acute respiratory failure requiring conventional invasive artificial ventilation, and (2) to supplement previous systematic reviews on prone ventilation for hypoxaemic respiratory failure in an adult population. SEARCH METHODS: We searched the Cochrane Central Register of Controlled Trials (CENTRAL; 2014, Issue 1), Ovid MEDLINE (1950 to 31 January 2014), EMBASE (1980 to 31 January 2014), the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (1982 to 31 January 2014) and Latin American Caribbean Health Sciences Literature (LILACS) (1992 to 31 January 2014) in Ovid MEDLINE for eligible randomized controlled trials. We also searched for studies by handsearching reference lists of relevant articles, by contacting colleagues and by handsearching published proceedings of relevant journals. We applied no language constraints, and we reran the searches in CENTRAL, MEDLINE, EMBASE, CINAHL and LILACS in June 2015. We added five new studies of potential interest to the list of "Studies awaiting classification" and will incorporate them into formal review findings during the review update. SELECTION CRITERIA: We included randomized controlled trials (RCTs) that examined the effects of prone position versus supine/semi recumbent position during conventional mechanical ventilation in adult participants with acute hypoxaemia. DATA COLLECTION AND ANALYSIS: Two review authors independently reviewed all trials identified by the search and assessed them for suitability, methods and quality. Two review authors extracted data, and three review authors reviewed the data extracted. We analysed data using Review Manager software and pooled included studies to determine the risk ratio (RR) for mortality and the risk ratio or mean difference (MD) for secondary outcomes; we also performed subgroup analyses and sensitivity analyses. MAIN RESULTS: We identified nine relevant RCTs, which enrolled a total of 2165 participants (10 publications). All recruited participants suffered from disorders of lung function causing moderate to severe hypoxaemia and requiring mechanical ventilation, so they were fairly comparable, given the heterogeneity of specific disease diagnoses in intensive care. Risk of bias, although acceptable in the view of the review authors, was inevitable: Blinding of participants and carers to treatment allocation was not possible (face-up vs face-down).Primary analyses of short- and longer-term mortality pooled from six trials demonstrated an RR of 0.84 to 0.86 in favour of the prone position (PP), but findings were not statistically significant: In the short term, mortality for those ventilated prone was 33.4% (363/1086) and supine 38.3% (395/1031). This resulted in an RR of 0.84 (95% confidence interval (CI) 0.69 to 1.02) marginally in favour of PP. For longer-term mortality, results showed 41.7% (462/1107) for prone and 47.1% (490/1041) for supine positions, with an RR of 0.86 (95% CI 0.72 to 1.03). The quality of the evidence for both outcomes was rated as low as a result of important potential bias and serious inconsistency.Subgroup analyses for mortality identified three groups consistently favouring PP: those recruited within 48 hours of meeting entry criteria (five trials; 1024 participants showed an RR of 0.75 (95% CI 0.59 to 94)); those treated in the PP for 16 or more hours per day (five trials; 1005 participants showed an RR of 0.77 (95% CI 0.61 to 0.99)); and participants with more severe hypoxaemia at trial entry (six trials; 1108 participants showed an RR of 0.77 (95% CI 0.65 to 0.92)). The quality of the evidence for these outcomes was rated as moderate as a result of potentially important bias.Prone positioning appeared to influence adverse effects: Pressure sores (three trials; 366 participants) with an RR of 1.37 (95% CI 1.05 to 1.79) and tracheal tube obstruction with an RR of 1.78 (95% CI 1.22 to 2.60) were increased with prone ventilation. Reporting of arrhythmias was reduced with PP, with an RR of 0.64 (95% CI 0.47 to 0.87). AUTHORS' CONCLUSIONS: We found no convincing evidence of benefit nor harm from universal application of PP in adults with hypoxaemia mechanically ventilated in intensive care units (ICUs). Three subgroups (early implementation of PP, prolonged adoption of PP and severe hypoxaemia at study entry) suggested that prone positioning may confer a statistically significant mortality advantage. Additional adequately powered studies would be required to confirm or refute these possibilities of subgroup benefit but are unlikely, given results of the most recent study and recommendations derived from several published subgroup analyses. Meta-analysis of individual patient data could be useful for further data exploration in this regard. Complications such as tracheal obstruction are increased with use of prone ventilation. Long-term mortality data (12 months and beyond), as well as functional, neuro-psychological and quality of life data, are required if future studies are to better inform the role of PP in the management of hypoxaemic respiratory failure in the ICU.

### Opening Internet Links

The links to internet sites in this document are 'live' and can be opened by holding down the CTRL key on your keyboard while clicking on the web address with your mouse

### Full text papers

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You can then access the papers by simply entering your username and password. If you do not have easy access to the internet to gain access, please let us know and we can download the papers for you.

### Guidance on searching within online documents

Links are provided to the full text of each document. Relevant extracts have been copied and pasted into these results. Rather than browse through lengthy documents, you can search for specific words as follows:

**Portable Document Format / pdf / Adobe**  
Click on the Search button (illustrated with binoculars). This will open up a search window. Type in the term you need to find and links to all of the references to that term within the document will be displayed in the window. You can jump to each reference by clicking it.

**Word documents**  
Select Edit from the menu, the Find and type in your term in the search box which is presented. The search function will locate the first use of the term in the document. By pressing 'next' you will jump to further references.

## B. Search History

|  | **Source** | **Criteria** | **Results** |
| --- | --- | --- | --- |
| 11. | EMBASE | (COVID-19).ti,ab | 1337 |
| 12. | EMBASE | (2019-nCoV).ti,ab | 309 |
| 13. | EMBASE | ((2019 ADJ3 Novel) ADJ3 Coronavirus).ti,ab | 399 |
| 14. | EMBASE | "CORONAVIRUS INFECTIONS"/ | 1246 |
| 15. | EMBASE | "CORONAVIRUS INFECTION"/ | 2174 |
| 16. | EMBASE | CORONAVIRINAE/ | 1361 |
| 17. | EMBASE | (11 OR 12 OR 13) | 1704 |
| 18. | EMBASE | (14 OR 15 OR 16) | 3555 |
| 19. | EMBASE | "PRONE POSITION"/ | 2517 |
| 20. | EMBASE | (Prone ADJ3 (Position\* OR Ventilat\*)).ti,ab | 10746 |
| 22. | EMBASE | "PATIENT POSITIONING"/ | 19934 |
| 23. | EMBASE | (Patient\* ADJ2 Position\*).ti,ab | 14717 |
| 24. | EMBASE | "BODY POSITION"/ | 20466 |
| 25. | EMBASE | (19 OR 20 OR 22 OR 23 OR 24) | 58427 |
| 26. | EMBASE | (17 AND 25) | 3 |
| 27. | EMBASE | (18 AND 25) | 4 |
| 28. | EMBASE | (26 OR 27) | 5 |

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